

Washburn Observatory 1878-1978

University of Wisconsin-Madison



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I

It is not clear what prompted former Wisconsin Governor C. C. Washburn's interest in astronomy; perhaps it was comments by the University Regents in 1869 that no institution of higher learning could aspire to the status of a university without an observatory; or perhaps it had to do with the establishment in 1876 of a magnetic observatory at the University, the only one of its kind in the country at that time. In any case, in "An Act to permanently provide for deficiencies in the University fund income" (passed by the legislature on March 6, 1876) Washburn had included a provision which specified that "the sum of \$3000 annually shall be set apart for astronomical work and for instruction in Astronomy . . . so soon as a complete and well-equipped observatory shall be given to the University in its own grounds without cost to the State, provided that such an observatory shall be completed within three years from the passage of this act." Along with the stipulation that state residents should not be required to pay tuition, this was the only condition placed on the use of the money, which was raised by a property tax.*

On Sept. 18, 1877, UW President John Bascom announced that Governor Washburn intended to meet the provisions of the act and provide a fully equipped observatory, including a telescope, which was specified to be larger than the 15-inch Harvard refractor. Washburn, a six-term member of Congress, Civil War Major-General, and Wisconsin governor in 1871-73, had been defeated in his try for re-election and so was devoting all of his attention to his business affairs. On the day before he was formally to select the site for the new observatory, his flour mill in Minneapolis exploded, killing several workers. Nonetheless he kept his appointment with the Regents before setting off for Minneapolis, perhaps thinking that it would be wiser to present a confident appearance to the business world in the face of this disaster than to delay the donation of the observatory.+ The observatory site was lovely—100 feet above Lake Mendota to the north, isolated from Madison to the east by the University campus, and surrounded by orchards and a vineyard.

Construction of the observatory began in May, 1878; the Clarks of Massachusetts were asked to build the telescope. With an aperture of

*In 1876 \$3000 represented one-seventh of the University's state-provided budget!

+This confidence was well-founded; when he died in 1881 his estate was valued at more than three million dollars.

15.6 inches, it was then the third largest refractor in the U.S., after the 26-inch and 18-inch instruments at the Naval Observatory and Dearborn Observatory, respectively. (Including the European refractors dropped the Wisconsin instrument only one notch, though there were many larger reflectors at the time.)

President Bascom wanted an active and prominent astronomer to become the Observatory's first director and found him in James C. Watson of the University of Michigan (then probably the country's most prominent school for astronomy.)* Watson had an international reputation for his discovery of 22 minor planets and for his book *Theoretical Astronomy*, the standard work in English for many years. He had become controversial with his claims for the discovery of the intra-Mercurial planet, Vulcan, first predicted by Leverrier 20 years earlier to account for the then unknown relativistic perturbation of Mercury's orbit. To judge by contemporary newspaper accounts, Watson was wooed by Wisconsin and Michigan with an ardor nowadays reserved for football coaches. However, Wisconsin, with its newer and larger telescope, won the day and in October, 1878, Watson occupied the Director's residence next to the Observatory, which had just been vacated by President Bascom.

With characteristic energy, Watson supervised the completion of the original structure, started work on the east wing (which included the Director's office), and with his own money began construction of the Students' Observatory, a short distance to the northeast of the main building, and of the Solar Observatory on the side of a steep hill south of the building. The former contained a small transit instrument and a 6-inch Clark refractor belonging to S. W. Burnham, then a court reporter in Chicago who came to Madison on weekends to search for double stars. This instrument was also to be used for instruction, enabling the 15-inch to be used for research. The Solar Observatory was intended for observations of the putative intra-Mercurial planets (Watson interpreting his 1878 eclipse observations as indicating two such objects). A 12-inch diameter underground tube led to a siderostat and long focus objective by which the sky near the sun could be examined visually. (The notion that such a device can enhance visibility of objects near the sun dies hard and is still periodically revived.) Unfortunately, Watson did not live to complete these projects since he died suddenly in November, 1880, when he was only 42. This was a

*Bascom commented, "... it is the intention of the Legislature and of the Regents of the University ... that the Observatory shall not be merely a monumental appendage to instruction, but shall be vigorously used in the general interests of science."



Cadwallader C. Washburn

great loss to the University. In less than two years at Madison he had become known not only as a distinguished astronomer, but had established a reputation as an excellent teacher, which was recognized in the local press: "His lectures are instructive, and that too, which few college professors' lectures are, intensely interesting."

Watson's successor was Edward S. Holden who came to Wisconsin from the U.S. Naval Observatory in 1881. Although Watson had not had the

opportunity to make any observations himself, the 15-inch was ready for research use by the Spring of 1881*, and when Holden finished the first volume of the Washburn Observatory Publications (Sept. 30, 1881), a considerable amount of visual work was underway. The observers were Burnham (who, with his 6-inch telescope had recently returned from a visit to Mount Hamilton where he observed many double stars as a test of that site for the planned Lick Observatory), G. C. Comstock (later Holden's successor as Director), and Holden himself. These observations were primarily micrometer measurements of double stars, but also included catalogs of nebulae and of red stars, and observations and drawings of the comet of 1881.

By 1884, the Observatory was equipped and set on a course of research it was to follow for the next 40 years. In addition to the 15- and 6-inch Clark telescopes (the latter purchased from Burnham), the observatory had acquired an excellent 5-inch meridian circle constructed by the Repsolds of Hamburg, which was mounted in the west wing of the main building. All told, Washburn had given more than \$65,000 to the Observatory, a very substantial sum in those days. In addition, Cyrus Woodman, like Washburn a New England expatriate, had long wished to associate his name with that of his friend and one-time law partner.+ After Washburn's death, Woodman found his opportunity by endowing the Observatory with \$5000 to support an astronomical library, an endowment still in existence today. By 1884 the Woodman library was a substantial one counting 1000 volumes and 600 pamphlets in its collection.

Three accurate pendulum clocks were also maintained, one for sidereal time, the other two for standard time. The Observatory set local time in Madison by controlling various clocks in the city, including one at the state Supreme Court, the Western Union office, the Park Hotel, and the Wisconsin State Journal,** as well as a clock in the University

*This was the occasion of a newspaper notice on April 9, 1881 in which Holden emphasized the astronomers' need for uninterrupted nights when working, and that in return for the public's consideration in this matter, the telescope would be available on the first and third Wednesdays of each month to anyone interested in viewing celestial objects. This practice has been maintained to this day.

+Woodman had once suggested that he and Washburn donate money to establish a School of Agriculture at the University, an idea which did not appeal to Washburn.

**A Milwaukee newspaper, apparently skeptical of the value of astronomy, commented in 1882 on the time-keeping service of the Observatory: "It is hoped that in this way that the Washburn Observatory may be of . . . practical value to the community, and that the wise liberality of its founder . . . may be vindicated."

President's office where it controlled bells signalling the beginning and end of class periods (then as now 50 minutes long). In addition the Observatory earned several hundred dollars a year by selling the time to Wisconsin railroads.

In 1880, the president of the Lick trustees had tried to interest Watson in becoming the director of the new California Observatory, but Watson died only a few months later before reaching any decision. Holden, the scientific advisor to the Lick trust, left Wisconsin to become the President of the University of California in 1885. He became the Director of Lick Observatory when the 36-inch refractor was completed three years later. For a little more than a year after Holden's departure, John E. Davis, the professor of physics whose enthusiastic research in electro-magnetism had led to the establishment of the magnetic observatory at Madison, took charge of the Observatory. A permanent director was not appointed immediately after Holden's departure because President Bascom's essentially forced resignation was soon to take effect and a new president had yet to be found. In the summer of 1887, the geologist T. C. Chamberlin* became president of the University and in August of that year, G. C. Comstock, then at Ohio State, returned to Madison as Associate Director of Washburn Observatory, with Asaph Hall of the Naval Observatory as non-resident Director. This awkward arrangement, perhaps occasioned by Comstock's relative youth (he was 32 on his return to Wisconsin) or by his lack of a Ph.D. degree, ended a few years later and Comstock became the third Director of the Observatory, an office he held for years longer than anyone else. Comstock had been trained at Michigan by Watson, the latter bringing him to Wisconsin as an assistant astronomer in 1879. Except for two years as professor of mathematics at Ohio State, Comstock's career was spent at Wisconsin. His astronomical work was that of precise, visual positional observations, a tradition begun by Holden. His first research, an accurate determination of the constant of aberration, along with an associated investigation of atmospheric refraction, quickly brought him to the attention of his peers. Throughout his long career he also measured visual binary stars, not only as objects of intrinsic interest, but also as part of an investigation of the proper motion of faint stars. This work indicated that some stars were intrinsically faint (and not just far away) and was an early hint of the concept of giant and dwarf stars. An important colleague of Comstock's for nearly 30 years was Albert S. Flint, an expert in visual positional astronomy with the meridian circle. Flint died in 1923 with the reduction of the last ten years of his observational work unfinished; this work was held in such high regard that the Department of Meridional Astronomy of the Carnegie Institution undertook to complete it, finally doing so in 1938.

*Chamberlin later became well-known to astronomers for his work with Moulton on the planetesimal theory of the origin of the solar system.

Comstock was prominent in the professional activities of his day; he was involved in the founding of the American Astronomical Society in 1897 and served the Society for ten years as its first secretary, and as its President in 1925; he was the chairman of the AAS committee formed to coordinate the observations of Halley's comet in 1910. In 1899 Comstock became the first Wisconsin faculty member to be elected to the National Academy of Sciences and five years later was appointed the first Dean of Wisconsin's Graduate School, a position he held for 16 years.

Since the founding of the Observatory, Washburn astronomers had relied entirely on visual techniques for their research, paying little attention to the rapidly expanding uses of photography in astronomy. This situation changed abruptly in 1922 when Professor Joel Stebbins left the University of Illinois to become the fourth Director of Washburn Observatory. For several years Stebbins had been trying to develop electrical means of detecting starlight, first with selenium cells and then beginning in 1913 with the more sensitive photocells. Dr. Jacob Kunz, a colleague of Stebbins's at Illinois, made these detectors in his laboratory while Stebbins tested them at the telescope. As these photocells were finally developed, they generally consisted of a quartz tube, the inside of which was coated with potassium hydride. Electrons emitted by this coating when it was exposed to light were collected at a ring anode kept at about +250 volts with respect to the coating, and the resulting current was detected by an electrometer. Two people were required—one at the telescope to set and guide on the stars and the other to measure the rate at which the string electrometer received an electrical charge from the photocell. Thus when Stebbins came to Wisconsin with his photocells the Observatory passed immediately from the 300-year-old era of visual astronomy to that of the new-fangled techniques of photoelectric astronomy, with not even a passing glance at photographic astronomy.

The Kunz tubes were very sensitive—more so than many modern photocathodes—but their use at the telescope with the delicate electrometers as detectors was difficult and required considerable experimental skill. The Lindemann electrometer, first used by Stebbins in 1927, improved this situation considerably since it could operate in any position, an obvious advantage at the telescope. However, the greatest improvement came in 1932 when A. E. Whitford at Washburn succeeded in constructing the first workable D.C. amplifier suitable for astronomical use. Although several people had attempted to use a new type of vacuum tube to amplify the feeble photoelectric currents, these attempts had not been successful because of fairly large random fluctuations in the amplified signal. Whitford solved this problem by enclosing the photocell and certain of the electronics in an airtight container when was then evacuated. This decreased the troublesome fluctuations to less than a tenth of their previous value and resulted in a four-fold increase in the sensitivity of the amplifier photometer compared to the older electrometer photometer. In addition, the two million-fold current amplification meant that the output signal could be measured by a galvanometer, a more rugged type of instrument than the electrometer; this simplified

work at the telescope, and made it possible to attack an extremely wide range of problems. Stebbins first exploited one of the chief virtues of the photocell, i.e. its ability to detect small variations in the intensity of light, variations too small to be detected by eye or photographically. In particular, Stebbins and Huffer (who was awarded the first Wisconsin Ph.D. in astronomy and remained as a faculty member) found several spectroscopic binaries also to be eclipsing systems which enabled them to derive fundamental data concerning the sizes, brightnesses, and masses of these stars. They also determined accurate light curves of Cepheid variables and showed that essentially all very high luminosity red stars were intrinsically variable. Huffer continued to specialize in photoelectric photometry of variable stars until his retirement from the University in 1961.*

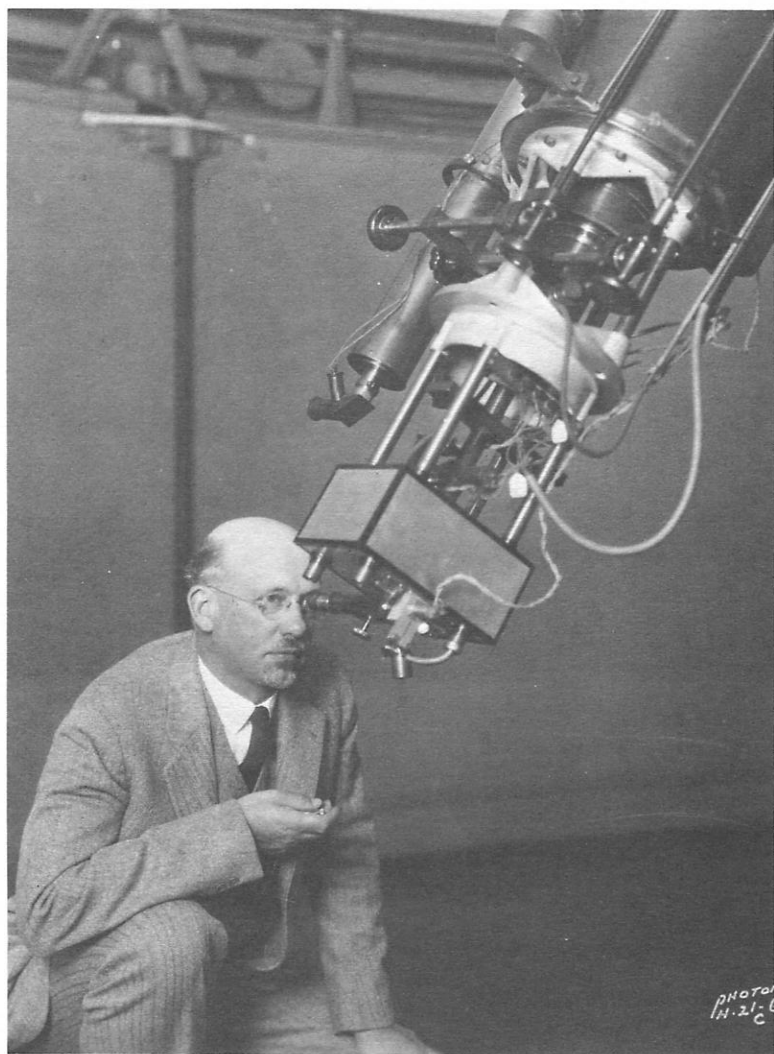
Immediately following Trumpler's demonstration in 1930 of the existence of dust between the stars, Stebbins, Huffer, and Whitford investigated the distribution of the clouds of obscuring matter in our Galaxy by measuring the colors of more than 700 luminous, blue stars, another application to which the photocell was well suited. The observations were made at the 15-inch telescope using the photocell electrometer combination. Given the stringent demands photoelectric astronomy places on the quality of the sky and the relative scarcity of such skies in Madison, this program was a particularly impressive achievement. After 1933 the electrometer was replaced by Whitford's amplifier and the Washburn astronomers observed 600 more such stars with the large reflectors at Mt. Wilson. Thus began a program of research on interstellar matter which 45 years later is still flourishing at Washburn. One of the highlights of this effort was Stebbins's determination in 1932 of the currently accepted size of our galaxy by his measurement of the effect of interstellar dust on the brightness of the distance indicators Shapley had used in his work on this problem. Stebbins's result, that the sun is about 30,000 light years from the center of the Milky Way galaxy, the outer edge of which is about 50,000 light years from the center, has scarcely been improved upon since. This demonstration that our galaxy was about half the size previously thought, combined with the somewhat later Wisconsin photoelectric work which showed that our neighboring spiral galaxy in Andromeda was about twice as large as had been previously believed, removed the large and somewhat disturbing difference in size between these two spiral galaxies. A by-product of the early work on the colors of stars was the important result that the intrinsic brightness of the hot, luminous stars (useful as distance indicators) was two to three times greater than previously realized.

* He also served as secretary of the American Astronomical Society from 1946 to 1955.

Another notable achievement of Washburn astronomers came in the 1940's when they showed that interstellar dust in various directions in space dimmed light of different wavelengths in a way which departed systematically from earlier results. In 1958, Whitford extended these investigations to the near infrared and published an extinction curve for interstellar matter which remains the standard against which other such determinations are measured. In this work the Wisconsin astronomers used the so-called six color photometry system, i.e. they measured the brightness of objects in six wavelength bands spaced from the violet to the near infrared. They devised this system for use on galaxies, in particular, as a means of determining the velocity of recession (the red-shift) of distant galaxies by measuring their colors over a wide spectral region. Using this system Stebbins and his colleagues not only determined accurate colors and magnitudes of galaxies, but also of globular star clusters, and of a wide variety of stars; from the latter they derived the color temperatures of stars which were the standard values for many years. This color system was the forerunner of modern photometric systems.

In the mid-thirties another important advance in the techniques of photoelectric astronomy occurred when Washburn astronomers began experimenting with the new photomultiplier detectors being developed by V. K. Zworykin at RCA. In this type of tube, electrons released from the light sensitive surface are not immediately collected as in a Kunz tube, but are first directed to a series of dynodes each of which releases 3 or 4 electrons for each electron incident upon it. In this way the initially weak photocurrent is increased by about one million times within the tube before it is sent to the amplifier. The first astronomical use of this detector was made in 1937 by Whitford and Kron in their automatic telescope guider. The Second World War interrupted this work, but by the late 1940's the RCA photomultiplier was in regular use at Washburn Observatory, along with pen chart recorders for the output signal. With these developments, astronomical photoelectric photometry had in essence achieved its modern form.

In 1948 Stebbins retired as Director of Washburn Observatory. More than any other astronomer he was associated with the development of photoelectric astronomy, beginning with instruments able to detect only the moon and ending with photoelectric measurements of faint galaxies. The achievements of his long and remarkably fruitful career were recognized by his colleagues by his election to the National Academy of Sciences in 1920, by his election as President of the American Astronomical Society in 1940, and in 1941 when he was the recipient of the Bruce medal of the Astronomical Society of the Pacific.



Professor Joel Stebbins

A. E. Whitford succeeded Stebbins as Director of Washburn. In the following decade research at Washburn continued along the directions set during the Stebbins era. (Perhaps the only departure was the Observatory's first venture into photographic astronomy which took place in 1956 when Code and Houck took photographs of the Milky Way in both the northern and southern hemispheres with a wide angle camera developed at Yerkes Observatory during the war.) However,

other aspects did change. For the first 70 years of its existence Washburn had remained a separate entity within the University. In 1948, however, it became part of the College of Letters and Science and by 1958 offered greatly expanded opportunities for advanced study in astronomy. Some astronomy has been taught at Wisconsin since the University was founded in 1849. In fact, J. W. Sterling, the University's first faculty member, was described as a professor of mathematics, natural philosophy, and astronomy. Throughout the University's early years, most juniors or seniors took nearly a year of astronomy. By the turn of the century several courses were given—general astronomy, celestial mechanics, practical astronomy, and astrophysics, and on an individual basis, graduate instruction. The total enrollment in these courses then was about 35. By the mid-thirties astronomy enrollments had increased to about 100, and by 1942 to more than 200, partially as a result of the war-inspired interest in navigation, which produced an enrollment of 80 students in the navigation course. In 1950 the first graduate courses in astronomy were listed in the UW catalog, and by the mid-fifties several advanced undergraduate courses as well as four graduate courses were offered.

Until this period only three astronomy Ph.D.'s had been awarded by the University (to C. M. Huffer, O. J. Eggen, and T. E. Houck), a graduate program being restricted by the limited course offerings and by an increasingly obsolescent telescope. In 1933 the 15-inch had been thoroughly refurbished, everything being replaced except the lens, tube, and declination axis. However, both Madison and the University were growing, producing more lights, smoke, and dust thus making astronomical research on Observatory Hill more and more difficult.* In a 1942 report to UW President Dykstra, Stebbins pointed out the need for a larger, modern telescope at a nearby, but better location. Whitford undertook the tasks of obtaining both a new country observatory and adequate space for offices, shops, library and instruction for the Department, which had outgrown its facilities in the original building. The former was realized in the mid-fifties, when the Wisconsin Alumni Research Foundation agreed to provide \$200,000 for the construction of a new observatory at a dark sky site near the village of Pine Bluff, about 15 miles west of Madison. The 36-inch mirror was ground and polished at the Yerkes Observatory optical shop, and Boller and Chivens constructed the telescope.+ A few years later they also provided a

*A song by Irving Berlin, "When It's Dark on Observatory Hill" indicated its use for other purposes.

+This instrument (along with an identical telescope now at McDonald Observatory) was the first to be built by this firm.

16-inch reflector which replaced a 12-inch telescope in the smaller dome at Pine Bluff. The new observatory was dedicated on June 30, 1958 (at the 100th meeting of the American Astronomical Society); Joel Stebbins was the principal speaker. Suitable quarters for the Department were obtained in the new wing of Sterling Hall (the physics building), which was occupied by the astronomers in 1959. Finally, through Whitford's representation, Wisconsin was one of the original founding members of AURA which established and operates the Kitt Peak National Observatory. Thus when Whitford went to California in 1958 to become the Director of Lick Observatory, he left behind an observatory well provided in its research equipment, its physical quarters, and in its academic course offerings for advanced training in astronomy.

III

A. D. Code, Whitford's successor as Director, was no stranger to Wisconsin, having served on the Washburn staff in 1951-53. On his return to Madison from California, Code was accompanied by a Caltech colleague, D. E. Osterbrock. Code and Osterbrock established what became the two primary strands of research at Washburn over the next twenty years—ultraviolet astronomy from space vehicles and the study of the properties of interstellar matter.

Osterbrock and his colleagues carried out extensive observations and theoretical calculations which helped to clarify the physical conditions—the temperatures, densities, chemical abundances, and dynamics—in diffuse nebulae, planetary nebulae, novae and supernovae remnants. The work of this group also showed that the emission line spectra of unusual systems like quasi-stellar objects and the centers of active galaxies could be understood by the same techniques used in the analysis of gaseous nebulae. Another significant result of this work, largely due to Mathis, was that the ratio of the abundances of hydrogen to helium in gaseous nebulae is constant not only in our galaxy, but also among nebulae in nearby galaxies as well. The large numbers of graduate students and of post-doctoral fellows who were associated with Osterbrock during this period comprise a significant fraction of the current researchers in this field.

In recent years observational studies of interstellar matter at Wisconsin have expanded into the ultraviolet spectral region (through the OAO-2, ANS, Copernicus, and IUE satellites) into the x-ray region (through work carried out by the Space Physics group at the University) and most recently into the radio region of the spectrum with the research carried on by Washburn's newest staff member.

Early in 1958, while he was considering a return to Wisconsin, Code was among scientists asked to comment on the possible astronomical uses of small satellites. Code responded with a suggested program of photometry in the ultraviolet (a region of the spectrum absorbed by the earth's atmosphere and, therefore, unobservable from the ground), which was a natural extension of both his own research and the traditions of Washburn Observatory. Late in that year Congress established the National Aeronautics and Space Administration, which quickly moved to begin the satellite program that evolved ultimately into the Orbiting Astronomical Observatory project. In 1959, Code, with the

late T. E. Houck, formed the Space Astronomy Laboratory, this consisting of a small group of astronomers, technicians, and students within Washburn, who began to study in detail the possibilities and problems of UV astronomy.

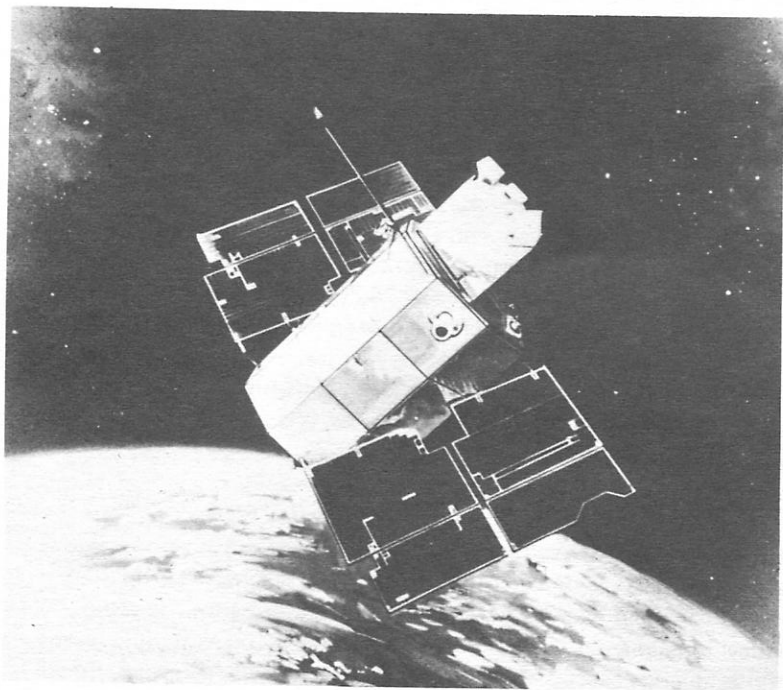
Several smaller projects were undertaken, beginning with the flight of a sky brightness photometer carried aloft by a weather balloon. Though certainly not a 'space' instrument, this provided useful experience in building a light weight, self-contained photometer and telemetry system.* Subsequent programs involved NASA's X-15 experimental rocket plane (which seemed to combine the capability of near-rocket altitudes with that of accurate pointing, not then available on conventional research rockets), and Aerobee sounding rockets. Results from these early SAL programs in UV filter photometry showed that earlier reports, that hot stars radiated much less energy in the UV than was expected, were incorrect and that the predictions of theory were approximately right.

Most of the effort at the Space Astronomy Laboratory, however, was directed towards the construction of Wisconsin's half of the astronomical payload for the Orbiting Astronomical Observatory. The other half would be provided by the Smithsonian Astrophysical Observatory, and the 3400 lb spacecraft by the Goddard Space Flight Center. The 500 lb Wisconsin payload contained seven reflecting ultraviolet-sensitive telescopes—four 8-inch and one 16-inch filter photometers, and two scanning spectrometers, along with their associated electronics. After the failure of the first OAO because of difficulties in the spacecraft power and guidance systems, two and a half years passed before OAO-2 was successfully launched on Dec. 7, 1968. The observatory could be pointed by ground command to any point in the sky to within one minute of arc and made to carry out any sequence of observations desired. It was the first true space observatory, and was in operation for 50 months. With OAO-2 Washburn astronomers observed about 1000 objects including planets, comets, a great variety of stars, star clusters, and galaxies. The enormous amount of new data obtained continues to yield useful results up to the present time. Among OAO results are the discovery that comets are surrounded by huge hydrogen halos; evidence that at least some novae increase their UV brightness at the same time that their visible light is fading rapidly; and that galaxies are systematically brighter in the UV than expected from the visual

*It also afforded Observatory staff and friends considerable excitement one soft summer evening as the 'launch' and flight proceeded from Second Point overlooking Lake Mendota.

colors of stars which make them up. OAO data have been used to investigate the physical properties of interstellar dust and to map the distribution of hydrogen near the sun; OAO data combined with measurements of the angular diameters of stars have enabled the first empirical determinations of the temperatures of the hotter stars.

Though UV astronomy and studies of the interstellar medium have become major activities of the Observatory, Washburn astronomers have pursued a wide variety of other astrophysical interests including observational studies of comets, planets, and the zodiacal light, and photometric measurements of the continua and spectral lines of stars of almost every type. Theoretical work here has addressed problems in a broad range of fields including stellar interiors, the transfer of radiation in gaseous nebulae and in stars, stellar winds, the shapes of spectral lines in a variety of situations, and studies of large telescope systems.



Orbiting Astronomical Observatory

Beginning with the Stebbins era, Washburn astronomers have devoted considerable effort to the design and construction of new instrumentation.* In addition to instruments already mentioned, there have been developed a variety of photoelectric spectrum scanning devices and also an echelle spectrograph, which makes it possible to carry out detailed studies of spectral lines without the use of Coudé optical systems. Development of the echelle here began a revival of interest in this type of instrument for use in stellar astronomy. The first automatic, computer-operated ground-based telescope was designed and constructed by the late J. F. McNall (of the Space Astronomy Laboratory) who was also a co-designer, with members of Lick Observatory, of the image intensifier-image dissector detector now used at several observatories. Recently the 36-inch telescope at Pine Bluff has been refurbished and instrument hardware and software made so that Washburn instruments can be easily used at the Kitt Peak National Observatory.

As the number of staff and graduate students increased in the 1960's and new activities developed, the administrative demands on the director became increasingly time-consuming. Consequently, it was decided that upon Code's resignation as Director in 1969, this position would henceforth be rotated among the staff. Osterbrock served in this capacity from 1969-1972, Bless from 1972-1976, and Mathis currently holds this position. In 1973 Osterbrock left Wisconsin to become the Director of Lick Observatory, the third from Washburn to do so.

The Department did not escape the turbulence of the Vietnam war years; early on the morning of August 24, 1970, Sterling Hall was badly damaged by a bomb which killed one physicist and injured other occupants. By a stroke of good fortune, the last astronomer had left the building a few minutes before the blast. Unfortunately, departmental quarters and several research projects, including a just-completed Ph.D. thesis, were damaged extensively. Nearly half of the floor space had to be evacuated during the year of reconstruction.

And so we recognize a century of contributions to astronomy by Washburn Observatory. Older traditions of research, such as the properties of the interstellar medium and the development of innovative astronomical instrumentation, are still being pursued along with more recent activities such as space astronomy. New directions are being established. We have every hope that Washburn Observatory's second century will be as exciting and productive as the first.

R. C. Bless, May 1978

*Partly to make the best use of the small telescopes and limited observing times available in Wisconsin.

